REVISIONS

LTR	DESCRIPTION	DATE	APPROVED
A	Changed location of CBORE note.	6/9/87	J. Buchanan
B	Changed .207 to 2.07 on outline drawing.	1/8/88	J. Buchanan

This drawing replaces Douglas drawings 7199000 and 7810956.

REV STATUS OF PAGES											
REV				B							
PAGES	1	2	3	4	5	6	7	8	9	10	

PREPARED BY J. Buchanan 4/3/87		DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO
CHECKED BY [signature] 4/6/87		TITLE SWITCH (COAXIAL L-BAND) RF TRANSMISSION LINE (1P2T REMOTE) FAILSAFE
APPROVED BY J.H. Buchanan 4/6/87		
SIZE A	CODE IDENT. NO. 14933	DWG NO. 87065
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AMSC N/A

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

GOVERNMENT

1. SCOPE

1.1 Scope. This drawing defines the requirements for the design, manufacture, and testing of a hermetically-sealed L-band antenna coaxial switch. This switch shall be used in aircraft acquired by the Navy.

1.2 Part number. The complete part number shall be as shown in the following example:

87065
|
Drawing number

2. APPLICABLE DOCUMENTS

2.1 Government documents. MIL-BULL-544E, Federal, Military, Industry Specifications and Standards, and NAVAIR Series Documents, approved by the Naval Air Systems Command, dated 5 April 1985, shall form a part of this drawing. Specifically, the following design and test specifications and standards are applicable.

SPECIFICATIONS

FEDERAL

ZZ-R-765 - Rubber, Silicone.

MILITARY

MIL-S-3928 - Switches (Coaxial), Radio Frequency Transmission Line, General Specification for.
MIL-E-5400 - Electronic Equipment, Aerospace General Specification for.
MIL-T-5422 - Testing, Environmental, Aircraft Electronic Equipment.
MIL-I-8500 - Interchangeability and Replaceability of Component Parts for Aircraft and Missiles.
MIL-E-17555 - Electronic and Electrical Equipment, Accessories, and Provisioned Items (Repair Parts): Packaging of.

STANDARDS

MILITARY

MIL-STD-202 - Test Methods for Electronic and Electrical Component Parts.
MIL-STD-348 - Radio Frequency Connector Interfaces for MIL-C-3643, MIL-C-3650, MIL-C-3655, MIL-C-25516, MIL-C-39012, MIL-C-49142, MIL-A-55339, and MIL-C-83517.
MIL-STD-810 - Environmental Test Methods and Engineering Guidelines.

(Copies of specifications and standards required by contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting activity.)

2.2 Order of precedence. In the event of a conflict between the text of this drawing and the references cited herein, the text of this drawing shall take precedence.

3. REQUIREMENTS

3.1 Materials. Materials shall conform to the requirements of MIL-E-5400 and shall be as specified herein. Materials which are not covered by applicable specifications, or which are not specifically described herein, shall be of the highest quality, of the lightest practicable weight, and suitable for the purpose intended.

3.1.1 Metals. Metals shall be of the corrosion resistant type or suitably treated to resist corrosion in fuels, salt spray, or atmospheric conditions to which the switch or parts thereof, may be subjected when in storage or during normal service conditions.

3.1.1.1 Finish. The unit shall be treated and painted in accordance with MIL-E-5400.

3.2 Design and construction.

3.2.1 General. The switch shall meet the requirements of MIL-E-5400 in its entirety and shall consist of a single-pole-double-throw "make-before-break" radio frequency switch, three radio frequency connectors, and one power connector built into a single metal container that is hermetically sealed.

3.2.2 Size. The switch shall conform to the dimensions shown on figure 1.

3.2.3 Weight. The weight shall be kept to a minimum consistent with good design and shall not be greater than 0.6 pound.

3.2.4 Connectors. The radio frequency coaxial connectors shall be of the high voltage SC type, the input connector having a male insert, the outputs having female inserts for 50-ohm coaxial line connection in accordance with MIL-STD-348 (interface, series SC, socket contact) and figure 2 herein. The electrical power connector shall consist of screw terminals designed to meet 50,000 feet altitude requirements. A protective cover shall be provided for this connector.

3.2.5 Switch operation.

3.2.5.1 Method of operation. The switch shall be operated by remote control. Actuating time shall not be greater than 20 milliseconds.

3.2.5.2 Life. The reliable operating life of the unit shall be at least 500,000 switching cycles.

3.2.6 Electrical requirements.

3.2.6.1 Actuating power. The switch shall operate with an actuating coil current of not more than 0.4 ampere when a voltage ranging between 18 volts dc and 30 volts dc is impressed on the power terminals.

3.2.6.2 Frequency range. The coaxial switch shall operate throughout the frequency range of 950 and 1225 MHz.

3.2.6.3 Voltage standing wave ratio (VSWR). The VSWR shall not exceed 1.3:1 at the frequencies specified in 3.2.6.2. VSWR values shall be relative to a 50-ohm coaxial transmission line.

3.2.6.4 Insertion loss. The insertion loss shall not be more than 0.3 db at the frequencies specified in 3.2.6.2.

3.2.6.5 Cross-talk level. The cross-talk level at each switch position at the frequencies specified in 3.2.6.2 shall not be less than 30 db down.

3.2.6.6 RF power. While the switch is being actuated it shall withstand the application of 3 kW peak power with a duty cycle of 0.1 to 0.2 percent and a pulse repetition rate of 120 to 150 cycles per second in the frequency range of 950 to 1225 MHz.

3.2.6.7 Environmental requirements. The switch shall be constructed to meet the requirements of MIL-STD-202, MIL-STD-810, and MIL-T-5422 as specified in 4.1.1.2.1 through 4.1.1.2.6 of this drawing.

3.2.7 Interchangeability. Interchangeability shall be as specified in MIL-E-5400. All parts having the same manufacturer's part number shall be directly and completely interchangeable with each other with respect to installation and performance, in accordance with MIL-I-8500.

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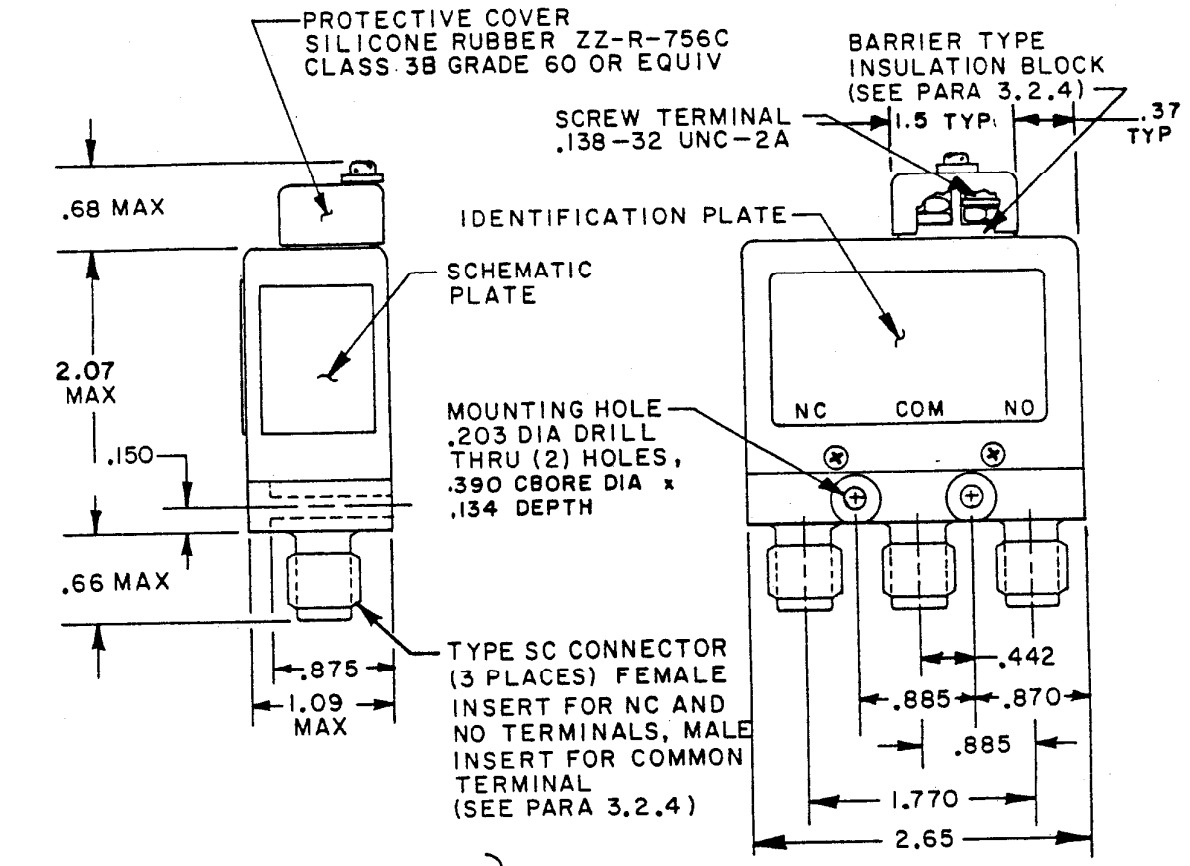

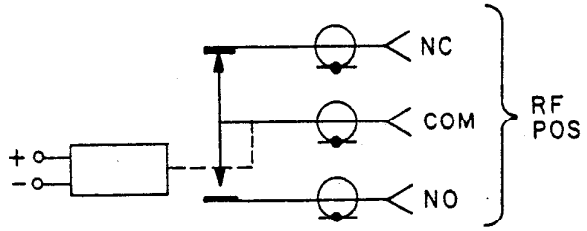

*SWITCH SHOWN IN FAILSAFE POSITION

NOTES:
1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Unless otherwise specified, tolerances are ±.005 (0.13 mm) for three place decimals and ±.02 (0.5 mm) for two place decimals.

Inches	mm
.134	3.40
.138	3.51
.150	3.81
.203	5.16
.37	9.4
.390	9.06
.442	11.23
.66	16.8
.68	17.3
.870	22.10
.875	22.22
.885	22.48
1.09	27.7
1.5	38.
1.770	44.96
2.07	52.6
2.65	67.3

FIGURE 1. Outline drawing schematic diagram.

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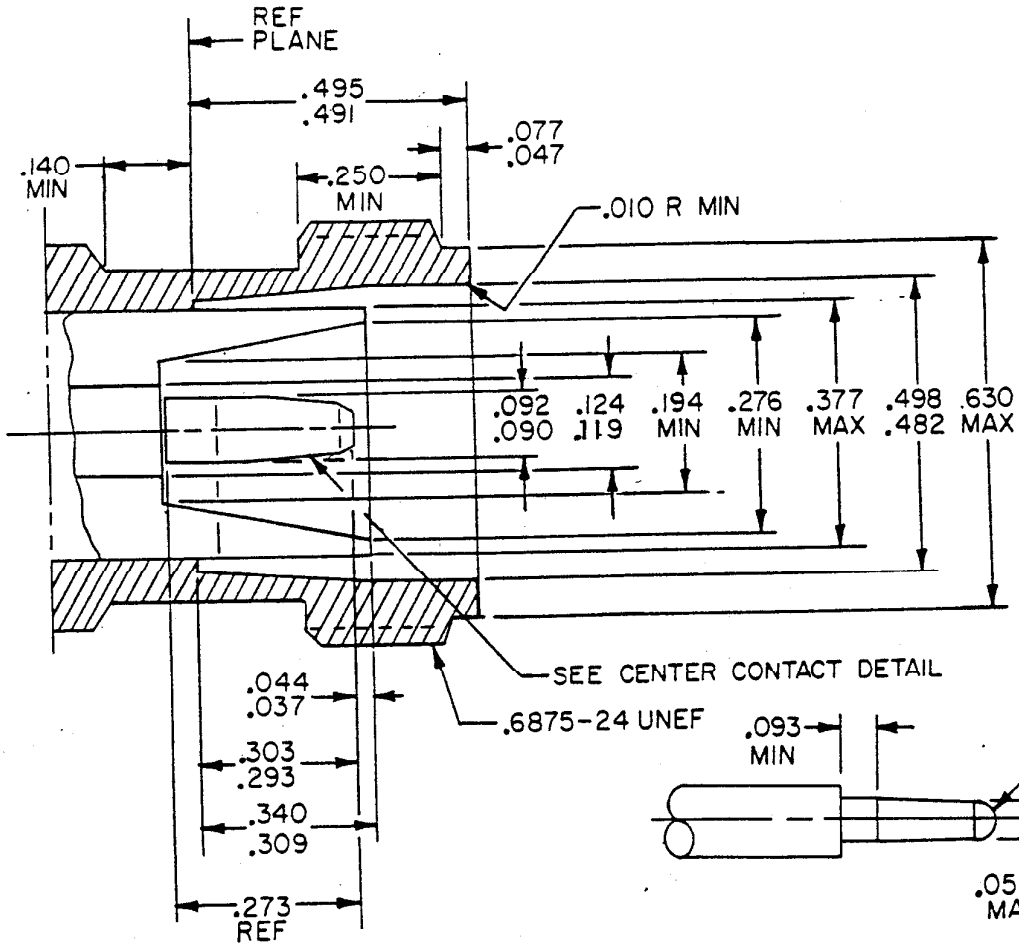

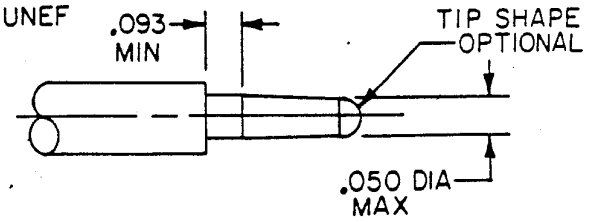

CENTER CONTACT DETAIL

Inches	mm	Inches	mm	Inches	mm
.010	0.25	.119	3.02	.347	8.81
.037	1.94	.124	3.15	.377	9.58
.044	1.12	.140	3.56	.482	12.24
.047	1.19	.194	4.93	.491	12.47
.050	1.27	.250	6.35	.495	12.57
.077	1.96	.273	6.93	.498	12.65
.090	2.29	.276	7.01	.630	16.00
.092	2.34	.303	7.70	.6875	17.462
.093	2.34	.309	7.85		

NOTES:
1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Unless otherwise specified, tolerances are ±.005 (0.13 mm) for three place decimals and ±.02 (0.5 mm) for two place decimals.
4. Reference: MIL-STD-348, interface, series SC, pin contact for insert and interface, series SC, socket contact for shell.

FIGURE 2. polarized SC interface.

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3.2.8 Performance. The switch shall satisfy the performance requirement specified in section 3 when subjected to the applicable tests of section 4 of this drawing. Failure to pass any of the tests shall result in rejection of the switch.

3.2.9 Identification. The following minimum information shall appear on the nameplate:

a. Part name.

b. DESC drawing number.

c. Manufacturer's part number.

d. Manufacturer's name or trademark.

e. Manufacturer's serial number, if applicable.

Marking shall remain legible at the end of the tests.

3.2.9.1 Connector designation. The three radio frequency connectors shall be designated as follows: The input connector shall be labeled "COM", one output connector shall be labeled "NC", and the other output connector shall be labeled "NO" as shown on figure 1.

4. QUALITY ASSURANCE PROVISIONS

4.1 Classification of tests. First article and inspection testing of the coaxial switch shall be classified as follows:

a. First article tests. First article tests are those conducted by a testing facility or laboratory mutually agreeable to the acquiring activity and the equipment manufacturer on samples submitted as meeting the requirements of this drawing to assure a satisfactory product.

b. Acceptance tests. Acceptance tests are those tests performed on all production parts to assure maintenance of quality.

4.1.1 First article tests. First article tests shall be performed on production articles as follows.

4.1.1.1 Performance tests.

4.1.1.1.1 Voltage standing wave ratio (VSWR). The VSWR of each switch position shall be determined by an approved method (see MIL-S-3928). The output positions shall be terminated in 50-ohm resistive loads during the test. The VSWR measured in each switch position shall not exceed 1.3:1 at frequencies of 950, 1050, 1100, and 1225 MHz.

4.1.1.1.2 Insertion loss. The insertion loss shall be determined for each switch position by an approved method (see MIL-S-3928) at the frequencies specified in 4.1.1.1.1. The insertion loss shall not exceed 0.3 db.

4.1.1.1.3 Radio frequency power capacity. Each switch shall withstand the application of 3.0 kW peak power with a duty cycle of 0.1 to 0.2 percent and repetition rate of 120 to 150 cycles per second at a frequency of 1075 MHz. During this test, the switch shall be operated for a period of 5 minutes at a rate of 70 ±15 cycles per minute. Each switch position shall be terminated in a 50-ohm resistive load. After this test, the VSWR and insertion loss shall be measured as specified in 4.1.1.1.1 and 4.1.1.1.2.

4.1.1.1.4 Cross-talk level. The level of cross-talk or interference shall be measured by determining the ratio of power being transmitted in the active output position to the power picked up in the unused output position. The active position and the position being tested shall both be properly terminated, with a 50-ohm resistive load. One position shall be selected as the active position and the other position shall be checked for cross-talk. The cross-talk level shall not be less than 30 db down at the test frequency specified in 4.1.1.1.1.

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f. Measurements shall be as specified in 4.1.1.2 except measurements during test shall be made at -54°C ±2°C.

4.1.1.2.4 Altitude test. The altitude test shall be performed in accordance with MIL-T-5422. The following details shall apply:

a. Class: Class 1.

b. Procedure steps: Steps 3, 4, 7, 9, and 10 except that 95°C shall be used in step 7.

c. Measurements shall be as specified in 4.1.1.2.

4.1.1.2.5 Moisture resistance. The moisture resistance test shall be performed in accordance with method 106 of MIL-STD-202. The following details shall apply:

a. Step 7b is not required.

b. Measurements after test shall be as specified in 4.1.1.2.

4.1.1.2.6 Shock test. The shock test shall be performed in accordance with method 213 of MIL-STD-202. The following details shall apply:

a. Mounting: Securely fastened by normal mounting means.

b. Test condition: A.

c. Measurements after test shall be as specified in 4.1.1.2.

4.1.1.2.7 Salt spray. The salt spray test shall be performed in accordance with method 101 of MIL-STD-202. The following details shall apply:

a. Test condition: B.

b. Measurements after test shall be as specified in 4.1.1.2.

4.1.1.2.8 Immersion (seal) test. The immersion test shall be performed in accordance with method 112 of MIL-STD-202. The following details shall apply:

a. Test condition: Test condition B, except use 2.5 inches of mercury for the test procedure.

b. Measurements after test shall be as specified in 4.1.1.2.

4.1.1.2.9 Life. The switch shall be actuated through 500,000 switching cycles at a rate of 70 ±15 cycles per minute, with a switch actuating time of not more than .02 second. During this test, no radio frequency voltage shall be applied. At the conclusion of this test, in addition to the VSWR and the insertion loss measurements called for in 4.1.1.2, a power capacity measurement shall be made as specified in 4.1.1.1.3.

4.1.1.2.10 Deterioration. At the conclusion of all of the above tests, the switch shall be examined and shall be visibly free of defects or deterioration. The switch shall be actuated and subjected to the tests outlined in 4.1.1.1.1, 4.1.1.1.2, and 4.1.1.2.

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4.1.1.2 Environmental tests. The following tests shall comprise the environmental testing requirements and shall be conducted in the order given. VSWR and insertion loss measurements of the two switch positions shall be made after completion of each environmental test, as well as, during the temperature extremes as specified in 4.1.1.2.2, 4.1.1.2.3, and 4.1.1.2.4.

4.1.1.2.1 Vibration test. The vibration test shall be performed in accordance with method 204 of MIL-STD-202. The following details and exceptions shall apply:

a. Mounting: Rigidly mounted.

b. Electrical load: A suitable indicating device shall be connected across the closed contacts to determine if contacts remain in the proper position.

c. Test condition: Test condition C, except that the frequency cycle shall be swept three times in each of three mutually perpendicular directions, one of which shall be parallel to the line of action of the RF switching mechanism. In addition, the frequency cycle shall be swept one time as above at 95°C ±2°C and at -54°C ±2°C.

d. Resonance: Required.

e. Measurements: During the test, a suitable indicating device shall be connected across the contacts to determine if contacts remain continuously in the proper position. During the test, the switch shall be actuated and cycled five times. At each position any sign of intermittent contact shall be noted. Measurements after test shall be as specified in 4.1.1.2.

4.1.1.2.2 High temperature. The high temperature test shall be performed in accordance with method 501 of MIL-STD-810. The following details shall apply:

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a. Procedure II.

b. Critical components: Not applicable.

c. Location of temperature sensors: Not applicable.

d. Test temperature: 95°C ±2°C steady-state.

e. Test duration: 50 hours.

f. Test item configuration: Normal operation.

g. Relative humidity: 5 percent maximum.

h. Measurements shall be as specified in 4.1.1.2.

4.1.1.2.3 Low temperature. The low temperature test shall be performed in accordance with method 502 of MIL-STD-810. The following details shall apply:

a. Procedure II.

b. Test duration: 72 hours.

c. Test item configuration: Normal operation.

d. Location of temperature sensors: Not applicable.

e. Test temperatures and time-versus-temperature:

(1) Maintain temperature at -62°C ±2°C for 48 hours.

(2) Raise temperature to -54°C ±2°C and maintain for 24 hours.

4.1.1.3 First article test reports. The manufacturer shall submit to DESC for engineering approval the number of copies of first article test reports specified on the purchase order. The test shall contain:

a. Production drawings showing envelope, cross sections, diagrams of test setups, data on methods and equipment used for testing and functional schematics, as required to permit complete engineering Navy evaluation of function, construction, materials, test methods, and test results.

b. A list of approved deviations.

c. Applicable portions of approved test reports on part to which similarity is being claimed.

4.1.1.4 Quantity of test articles. All tests covered by this drawing shall be run on one article. At least 20 percent of the service life shall be run before the environmental tests are performed, and at least 10 percent after the environmental tests have been completed. All tests shall be successfully completed without the necessity for rework or replacement of parts.

4.1.2 Acceptance tests. Acceptance test shall be conducted as follows:

4.1.2.1 Examination of product. The switch shall be carefully examined to determine conformance to the requirements of this specification which are not covered by specific test procedures in respect to accuracy of dimensions, quality of workmanship, maximum weight allowed, use of proper materials and finishes, visible defects, and any other imperfections that would result in rejection of the switch.

4.1.2.2 Performance tests. These tests shall consist of VSWR and insertion loss measurements at frequencies of 950, 1100, and 1225 MHz.

4.1.2.3 Certification. The manufacturer shall submit with each switch assembly or with each lot of switch assemblies shipped, inspection tags or certificates endorsed by an authorized representative of the manufacturer or laboratory as applicable, indicating compliance with each production test.

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4.2 Waiver of tests. Satisfactory completion of the tests shall not constitute absolute proof of compliance with every specified design requirement, but does provide reasonable proof that satisfactory operation should be obtained for most normal operating conditions. If it can be shown by drawings that an equal, similar, or modified unit is physically similar to its prototype which has passed a complete prototype test, and if it can be proven by appropriate experimental or analytical evidence that the modified unit in addition to being physically similar is likewise functionally similar to its prototype in a strict sense, the test requirements for the modified unit may be waived or reduced with prior approval by the acquiring activity. Claims of similarity shall be substantiated by evidence showing that all individual parts of the modified unit will withstand structural and operational loads of an equal magnitude to those applied to the basic unit.

4.3 Failure during tests. Any characteristics exhibited by the switch such as deterioration, power loss, overheating, binding, sticking, excessive power drain, excessive corrosion etc., during any of the tests specified herein which would cause disability of the switch to meet any of the requirements of section 3 of this drawing while in service, shall constitute failure of the switch to pass the test and shall be the basis for rejection of the equipment.

4.4 Certificate of compliance. First article test reports must be authenticated by a government inspector, or a written waiver must be secured from the government inspector prior to the conduct of the test and a copy of the waiver supplied with the first article test report.

5. PACKAGING

5.1 Preservation and packaging. The preservation and packaging shall be in accordance with MIL-P-17555. In addition, plastic or metal caps shall be used to cover all openings to prevent dirt, dust, or metal particles from entering the unit.

5.2 Packing. Packing shall be in accordance with MIL-P-17555.

5.3 Marking of shipments. Marking of shipments shall be in accordance with MIL-P-17555.

6. NOTES

6.1 Intended use. This switch is to be used to alternately connect two antennas to an airborne transmitter-receiver.

6.2 Ordering data.

a. Title, number, and date of this drawing.

b. Levels of preservation and packing.

6.3 Comments. Comments on this drawing should be directed to DESC-ECT, Dayton, Ohio 45444, or telephone 513-296-5371.

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